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ABSTRACT

This paper is concerned with the challenges of qualitative research on workplace learning that occurs within co-operative (co-op) education. Co-op education is extensive in Canada, with an estimated 10% of the student population enrolled in co-op secondary education each year. The context for this study was a veterinary clinic in which four co-op students participated. The theoretical framework for the study considered the workplace experiences as curriculum, the special character of experiential learning, and a cognitive perspective on learning from experience. Methodological challenges were evident in four related areas: (1) observation in an unfamiliar setting; (2) goals of the workplace setting; (3) conceptions of knowledge and curriculum; and (4) varieties of learning. The methodological challenges recognized in this study highlight the interplay among the theoretical framework, data collection methods, and data analysis procedures. (Contains 16 references.) (SLD)

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CO-OPERATIVE EDUCATION: CHALLENGES OF QUALITATIVE RESEARCH ON LEARNING IN THE WORKPLACE[1]

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Introduction

This paper is concerned with the challenges of qualitative research on workplace learning that occurs within co-operative (co-op) education. This part of the secondary-school curriculum is named for the co-operation between schools and employers. It involves students spending part of the school day in a workplace setting for extended periods of time while enrolled in full-time study. Typically, students also engage in classroom orientations to the workplace and in reflective seminars. Co-op education is extensive. For instance, we have estimated that 10% of Canada's 1.55 million secondary-school students enroll in co-op education each year (Munby, Cunningham, & Chin, 1998). Oddly, there is hardly any research literature on this portion of the school curriculum, suggesting to us that nobody is asking curriculum questions about co-op education, such as the sort of learning that it can provide or about how this learning might be enhanced. This paper reports on the challenges of researching co-op experiences in a veterinary clinic from the perspective of learning in the workplace. It highlights the process of our research and serves as a companion to our paper that reports on our substantive findings (Munby, Chin, Hutchinson, & Young, 1999).

The paper opens with a brief statement of the background to the research and then provides an outline of the theoretical framework that informs the research we have conducted at the veterinary clinic. This is followed by a description of the setting. The text then turns its focus to how the research team monitored and modulated its procedures for data collection and analysis, with particular attention to the interaction between features of the setting and the direction of the analysis.

Background to the Research

The background to this research lies in the disparity between the extent of co-operative education in secondary-school programs and the amount of research directed at such activities. As we have already noted, enrolments are substantial (e.g., "Enrolment in Co-operative Education," 1998) but research in the area is minimal. A recent systematic literature search identified a study of workplace socialization (Simon, Dippo, & Shenke, 1991) and a multivariate study showing no significant effect of co-op placement on scores on career maturity (Varner, 1994). The paucity of research information on co-operative education has a direct bearing on curriculum questions, from local instructional questions to policy questions at the district, provincial, and national levels (Munby, Hutchinson, & Chin, 1998). Among the questions that should be addressed are: "What is learned by students in co-op placements, and how is this learning assessed?" "How might learning from experience be understood so that it can be

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enhanced?" "How might educators make the implicit curriculum of co-op education explicit in their interactions with students and with workplace supervisors?" and "What provisions are made in co-op placements for students with exceptionalities?" The obvious connection between co-op education and career education makes the development of reliable information about workplace learning even more urgent.

We have initiated a program of research at Queen's University to establish a knowledge base for education about the world of work. One strand of this research program concerns identifying a theoretical framework for studying learning in the workplace. As shown below, some theoretical frameworks are currently available. But none quite suits the need for a theoretical approach that can guide instruction and assessment for the kind of workplace learning that secondary-school students might encounter in co-op education and career education. This paper highlights the interplay that exists among the theoretical framework, the data collection, and data analysis.

Although co-operative education credits are taken by a significant number of secondary-school students each year, this portion of the curriculum has received scant attention in the research literature. As shown in the following section, there has been an increase in research on workplace learning itself, but this research has been driven by a focus on the organization, its structure and function, and most of the research is with adult learners. Very few studies on informal and workplace learning pay heed to the relationships between learning, knowledge, and experience, and fewer (if any) consider co-operative education placements.

Theoretical Framework

A major part of the early work in this research program has been the identification and modulation of theoretical frameworks. A search for theoretical and empirical research on workplace learning was initially discouraging. For example, Berryman (1993) found that although studies on informal learning are "critical to the current enthusiasm for work-based apprenticeships, [they] are so few as to preclude a review of any length" (p. 345). A strand of research in workplace learning was developed by Marsick (1987). Marsick defined workplace learning as involving "reflection by individuals and working groups upon their own experience as part of the organizational whole" (p. 3). Marsick argued that learning in the workplace involves negotiation between participants about setting and achieving goals, and about roles and responsibilities. Watkins and Marsick (1992) extended this approach to learning in organizations by identifying four distinct learning types: informal learning, formal learning, incidental learning, and non-learning. They defined learning in the presence of both action and reflection as informal learning, and in the presence of reflection but absence of action as formal learning. Absence of reflection in the presence of action was defined as incidental learning, whereas the absence of both reflection and action was defined as non-learning.

This approach seemed to us to be less suitable to learning in co-operative education settings for several reasons. First, the research was directed at adults rather than at adolescents. Second, the approach was concerned with the workplace alone, whereas co-operative education involves the students in in-school instruction also, so roles and responsibilities are different. Third, Marsick specifically distinguishes workplace learning from education, when co-operative education clearly has a role to play in educating adolescents about the world of work. The theoretical framework needed for our research must satisfy a number of criteria, many of which are closely related to the educative potential of co-operative education in the secondary-school system. That is, the theoretical approach must admit a consideration of the workplace experiences as curriculum. So the importance of the experience, of the planning, and of the instruction provided by those at the workplace must be visible in the framework. Equally, the framework must recognize the special character of experiential knowledge, and must provide a cognitive perspective on learning in experience that will permit the research team to identify what features of instruction promote learning and can be incorporated into instruction that could enhance workplace learning.

Although the framework needs to allow for a focus on the learner in the workplace, it must also allow for the research team to understand a basic tension we noticed in our studies of the veterinary clinic: the primary goal of the workplace setting is not learning, although the primary goal of school is. In the veterinary hospital, the goal is patient health and recovery and the activities are centered around this goal, while teaching is a subsidiary goal. In classrooms, of course, the purpose is learning and activities tend to be aimed in that direction. Activities directed at patient health and recovery are the routines of the hospital, and the effective participation of all concerned within these routines is paramount.

Lave's (1988) text on situated cognition and Lave and Wenger's (1991) work on situated learning and legitimate peripheral participation seemed useful to the task. This approach allows us to include the research of Bandura (1986) and others on observational learning and action representations. Also useful is Schön's (1983) argument that knowing-in-action is a legitimate form of knowledge, and the derivative view that experience itself has an authority (Munby & Russell, 1994). The implications of this framework on data collection and data analysis serves as the main focus of this paper.

Methods of the Case Studies

The Clinic Setting

The research was conducted as case studies of four co-op students in their placement, a "small animal" hospital (also referred to as a veterinary clinic) that has operated in its current location for approximately a decade. The building contains a spacious reception area, the veterinarian's office, space for dog grooming, four small examination rooms, six dog runs, an isolation ward, a laboratory, an x-ray room, a preparatory room, a surgery, and a surgical ward. Most of the data gathering occurred in the preparatory room and the surgery with the remaining observations and data gathering occurring in the surgical ward or laboratory. Since the examination rooms are very small, we did not attempt to observe at these locations.

The veterinarian, Bill[2], founded the clinic and has practised there ever since. He specializes in the care of house pets, mainly geriatric dogs and cats. He has arranged his practice so that the scheduled clinic appointments and the scheduled surgeries take place in the morning. The afternoons are left for walk-in traffic. We collected data during the mornings to coincide with co-op student placements and increased clinic activity.

The Clinic Personnel

The clinic personnel include the veterinarian (Bill), two veterinary technicians (Kelly and Jill), and an animal-care aide (Sue). Although clinic personnel make up the clinical teams, not all were typically present at any one time. Surgical teams, for example, were mostly composed of three people: the veterinarian, the animal-care aide, and a co-op student or veterinary technician. The members of the surgical team were responsible for distinct aspects of the surgical routine: Bill performed the surgery, Sue assisted Bill, and the co-op student or veterinary technician managed the anesthetic machine. The animal-care aide and the veterinary technician could interchange roles but Bill and the co-op students did not change their respective team functions. During less complex procedures (e.g., teeth cleaning, or induction anesthesia) a veterinary technician and the animal-care aide might comprise a clinical team. If a co-op student was present who was at an appropriate level of trust, she might replace one of the staff. Rarely were there situations when the two veterinary technicians worked together or when three or more clinic personnel formed a team..

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[2] Fictitious names are used in this paper to refer to clinic staff and co-operative education students.

The Co-op Students

Four co-op students participated in the two placements that comprise this study; each placement included two co-op students. In the first placement, Kate and Ruth participated in the study and in the second placement, Ann and Jane participated in the study. All four students were female and all four students were participating in the co-op education placement as part of a high school biology credit. Kate was in grade eleven, Ann and Jane were in grade twelve, and Ruth was in OAC. When we entered the clinic in the spring of 1997, Ruth was entering the clinic for her second co-op placement since she had also spent time at this clinic during the fall term. Kate, on the other hand, was entering the clinic for her first time. In the fall of 1997, during the second placement, we met Ann and Jane. Ann had been volunteering on her own during the summer, whereas Jane entered the clinic for the first time in mid-September.

The co-op students were added to the clinical teams on an as-needed basis, usually performing the duties of the animal-care aide. Co-op students at the beginning of their four-month placement are not trusted as much as co-op students nearing the end of their placement. The degree to which a co-op student fits in as a clinical team member appears to depend upon the clinic personnel's assessment of her performance.

The Clinic Routine

What follows is a typical morning at the animal hospital. We say typical although each morning was, in some respect, atypical. Unforeseen circumstances, unusual cases, or unfortunate accidents occasionally altered the activity in the clinic but the staff always guided things back to an established routine. This routine provided structure and predictability for us and for the co-op students. We try to capture the flavor of that routine by presenting a typical morning.

Co-op students arrive at the clinic each morning between 8:30 a.m. and 9:00 a.m. The first student arriving goes to the dog runs and takes each animal out for a walk. The second student arriving has the job of cleaning the dog cages and replenishing food or water supplies. This usually requires about twenty minutes. When they are finished, both co-op students go to the surgical ward to read the charts of the animals slated for surgery that morning. Sue often helps them with this by providing anecdotes and advice about animals and the impending surgical schedule. At this point, if clinic business is brisk, the students go to the front of the clinic to help Bill and Sue in the examination rooms with daily consultations. These consultations involve the animal, the animal's owner, Bill, and a co-op student. Often, Sue or Kelly is also present in the room. When a student is present, she is required to hold the animal, assisting Bill while he examines and treats the patient. If the clinic business is slow, the students check a work list and complete housecleaning tasks that are outstanding. The staff regards student initiative in this respect as a praiseworthy quality.

During the morning consultations, Sue also prepares for the morning surgeries. If there is more than one patient, she guesses at the surgical order and instructs the co-op students accordingly. The students prepare the appropriate equipment and resources for the surgeries. Bill often enters during this time; he affirms the surgery order then administers an induction anesthetic (made from a ketamine and valium mixture). He waits a few moments to make sure that the patient is in no danger and properly attached to the anesthetic machine before returning to the examination rooms for the concluding morning consultations.

Sue and one or two co-op students prepare the surgery and monitor the anesthetized animal. Bill enters, prepares very rapidly, and begins. Sue assists Bill by monitoring the students and making sure that the correct equipment is functioning, sterilized, and available for Bill. One co-op student (mostly Ruth in the first placement and Ann in the second placement) manages the anesthetic machine during surgeries. The other co-op student (mostly Kate in the first placement and Jane in the second placement) is not part of the team and watches the surgical procedure.

When Bill is finished closing a patient he hands control over to Sue, expecting that she will supervise the cleanup. Bill leaves and Sue and the co-op students remove the anesthetized animal to the recovery ward and wash the instruments, drapes, and gowns. After cleaning and disinfecting these, the co-op students are involved in assembling surgical packs for sterilization in the autoclave. Bill may return to do another procedure and the students may be involved in cleaning up more surgeries but the pattern remains the same. Often, it is 11:00 a.m. before the students have finished what they are doing and they have to leave.

The Researchers/The Study

Two graduate students gathered data on-site. Two faculty members were intensively involved in on-site visits during the initial phase of the study, but made fewer visits during later phases. Both graduate students had completed a graduate level qualitative research methods course but otherwise had no experience gathering data in the workplace. Data gathering occurred in two phases: an initial pilot phase during the first placement (spring 1997); and a study phase during the first and second placements (spring and fall of 1997).

The researchers audiotaped each period of observation by using tape recorders, and took extensive notes to document the activities in which the various clinic teams engaged. The co-op students were interviewed formally twice during their placements, and the staff members were interviewed four times during the year. All audiotapes were transcribed.

Methodological Challenges

The analysis for this paper is a product of the research team's decision to assume a reflective stance, and to ask what it had learned about gathering and analyzing data for the study of secondary-school students' learning and knowledge in the workplace. Many of us are familiar with classrooms and how to collect data within them. But the workplace is different, and the learning that occurs in the workplace is much different. As stated earlier, our data gathering and analysis needed to consider the workplace experiences as curriculum, the special character of experiential learning, and a cognitive perspective on learning from experience. Data analysis and reflection led to methodological challenges that demonstrate the close relationship between elements of context or setting and analytical techniques. We highlight these issues within four related areas: (1) Observation in an unfamiliar setting, (2) Goals of the workplace setting, (3) Conceptions of knowledge and curriculum, and (4) Varieties of learning.

Observation in an Unfamiliar Setting

In the spring of 1997 we entered the veterinary clinic very naïvely. We wished to study workplace learning but, when faced with the actual setting, we had trouble framing suitable research questions to focus our research and, consequently, our research methods. Moreover, since no one in the research team is a veterinary doctor, the procedures, diagnostic practices, equipment, clinic language, routines, and expectations were as new to us as they were to our high-school co-op student participants. This initial pilot phase, lasting two months, oriented the methods of our inquiry at the clinic to match what we were witnessing. We used this period as an opportunity to develop a framework grounded in the activity of the clinic. For the last two months of the first placement and the entire second placement, we used what we had learned during the pilot phase to guide observation and data collection.

Members of the team were totally unfamiliar with the procedures of a veterinary clinic. Much time was needed to learn what to observe, to discriminate between the routine and the unusual, and to learn how to anticipate in the way we do when observing in classrooms. In an important sense, we were participant researchers, because we too were learning in the workplace. Unfamiliarity had further consequences. In the pilot phase of the study, staff explained procedures and the students could learn from the explicit

instruction we were given, thus confounding our study of how the workplace provides opportunities for student learning. Our data have examples of the veterinarian explaining symptoms and diseases to the researchers and not directing the explanations to the students who were in the same room. Such incidents occurred less frequently in our data collection during the second placement.

During the initial pilot phase, the research team spent approximately four hours per week at the veterinary clinic. We initially went to the clinic site in pairs (typically one graduate student accompanied one faculty member) armed with clipboards and one hand-held tape recorder. Since the veterinarian clinic was quite cramped, and the activities of the clinic were frantic at times, we typically maintained the stance as observers and limited our questions to opportunities (if available) at the beginning and at the end of our visit.

Although we discussed the data collection procedures at our weekly research team meetings, we made little alteration to the collection methods early on because we recognized the importance of our own need to learn about the veterinarian clinic. At the conclusion of the pilot phase the research team made four major alterations to data collection. First, we decided that it was now sufficient to have only one researcher on-site so that we could minimize our disruption of the day to day business of the clinic. Second, we reduced our visits to once per week because we recognized that the clinic activities centred around fairly stable routines (as has been described earlier). Third, we recognized the need to focus our data collection on clearly documenting the roles played by the co-op students within the events of the clinic routines, and such rich descriptions of clinic events needed to capture the subtle increases in responsibility that the co-op students were being given. This was especially important in terms of their specific responsibilities associated with preparing animals for surgery, and with the surgery itself. Fourth, and perhaps most important, we saw a need to gain access to more immediate data from participants that could not wait until formal interviews were conducted. This fourth point highlights the interplay between the theoretical framework and the data collection.

Berryman (1993) stated that we know very little about informal learning in the workplace, and consequently, we also know very little about how to conduct research on learning in the workplace. Thus, much of our initial work in this area (see Chin, Young, & Munby, 1998; Munby, Cunningham, & Chin, 1998) attempts to address both challenges. In our deliberations after the pilot phase of the study, we recognized the need to utilize a theoretical framework that considered workplace experiences as curriculum, the special character of experiential learning, and a cognitive perspective on learning from experience. We found the work in situated learning, observational learning, knowing-in-action, and the authority of experience (as cited earlier), quite helpful to informing our conceptual understandings, but less helpful to informing the operational pragmatics of collecting data. We believe that a theoretical framework that includes reflection and action as the main components of informal and incidental learning must use data collection methods that reflect the complexity of the learning environment, and capture the process of learning at the time that learning occurs. We achieved this by taking the stance that we needed to interact with participants in two distinctly different ways: intervention on-the-spot and interactions after the fact.

In situations where clinic personnel were engaged in an activity, the researchers began to interject to clarify something that was not immediately apparent. Although this interrupted the flow of activity at the time, the clinic staff and students appeared comfortable enough with the researchers that such incursions were not too disruptive. In situations where clinic personnel were too busy and could not provide answers on the spot, the researchers made a note of this in the fieldnotes. Later, during a lull in the activity, the researchers approached participant(s) to explain their activity.

On-the-spot interactions between the researchers and the participants were not planned and they frequently took the form of polite conversation while a participant was engaged in some activity. By doing this, we wished to capture some of the immediacy between learning and action. A brief example will illustrate the point.

Sadie the Cat: A Brief Vignette

> Sadie is a very friendly brownish-golden tabby cat. She comes up to the bars of her cage expecting pets from who ever is there. Sadie is at the clinic for an ovohistorectomy and a rabies vaccination. Ruth is organizing the bags on the anesthetic machine (the issue of bag size was a source of some embarrassment for Ruth not long before) when she says "I think I have the right [sized] bag on now."
> The researcher asks, "What was going on with the bag? [referring to the earlier incident]"
> "You have to have the right sized bag for the animal," Ruth ventures.
> "How do you determine which bag goes on?" the researcher pursues.
> Ruth begins to offer an explanation but Jill interjects.
> "There's a certain calculation that go through if you want to be really technical but basically what we do is say, 'Yeah, this bag, it's the cat bag size 1.' You're looking at basically the size of their lung capacity. You're not going to throw a 3 L bag on there you'd drown the cat."
> "So the bag is more or less the capacity of the lung," the researcher observes.
> "Basically," Jill confirms, "if you calculate it out properly that's the way it's supposed to be ... like total volume and everything, but we don't do that here. We just say 1 is a cat bag, 2 is a small dog bag, and 3 is a large dog bag. Makes it a lot easier."
> "Sometimes there's dispute over what is a large cat and what is a small dog then?," the researcher probes.
> "Yep, sometimes. Sometimes I'll put something on and he'll [Bill] rip it off and put something else on, " she explains. (May 8, 1997)

The researcher intervenes as Ruth is setting up the anesthetic machine. Bill had corrected her for her choice of bags in an earlier surgery and she appears to be carefully making her choice this time. The researcher's interjection is important in that it provides Ruth with an opportunity to explain what she is doing (as she is doing it) and why it is so important to be able to do it correctly. Jill's interruption is also important. Jill offers a level of explanation that Ruth cannot, thereby satisfying the content of the researcher's question. She also provides Ruth with a verbal salve at the end, admitting the same thing has also happened to her.

Lulls in clinic activity occasionally provided ideal opportunities for the researcher to clarify situations that were not explicit. Like the on-the-spot interaction described above, these interactions were mainly conversational. During an active period, the researcher would note something he/she wanted to pursue and wait for a lull in the action. Once an opportunity presented itself, the researcher sought clarification. An example of this type of interaction is illustrated below.

An Old Dog: A Brief Vignette

> Bill leads an old dog into the preparatory room. The dog does not come in with a name although the owner has requested that Bill put the animal down. Ruth and Kate assist Bill with the procedure. Since the clinical team in this instance is comprised of Bill and two co-op students, one of the students must roll the dog's vein for Bill while the other student holds. Ruth rolls the vein, Bill administers the lethal injection and the dog, gasping loudly, slumps onto the table. Kate and Ruth gently guide the animal on its side. Bill gives the students instructions concerning the disposal of the body then leaves. As the students are cleaning up, the researcher talks to them about the euthanasia when it becomes apparent that both students know how to raise a vein. This is unusual because students are not normally taught this.
>
> The researcher asks Kate, "When did you learn how to raise the vein?"
> "Probably ... I think it was around two and a half weeks ago," Kate replies.
> "And which vein is it that you are raising?" the researcher asks.
> "Ummm ... the, I don't know what you call it, it's the one right on the arm, yeh," Kate continues.

> "Yeh, and how do you raise it? " the researcher pursues.
> "You just, when you grab the dog you just ... like this [Kate demonstrates a hold] and then you roll it like that [demonstrating with a rolling motion of her hand]." (May 29, 1997)

Rolling the vein is a crucial part of proper clinical care of animals. The procedure requires that three people are present: the veterinarian to administer the injection; a person to roll the vein and keep the animal's jaws away from the veterinarian; and a person to hold the hind quarters of the animal securely. After the fur on the front paw is shaved away, the person responsible for rolling the vein grasps the dog about the head, lifting the head up and away from the veterinarian who approaches the dog from the front. The person responsible for rolling the vein grasps the dog's shaved leg with the free hand and rolls the wrist over thus exposing the vein. Meanwhile the second assistant firmly holds the animal's hindquarters. The clinic staff usually roll the vein so this situation is unusual in that the students did the job.

Also worthy of note is Kate's manner of describing what she means. She is not able to name any aspect of vein rolling in terms of language and she resorts to gestures to get across what she means. This conversation took place about 10 minutes after the dog quietly died on the table. Kate appeared to reflect upon the activity of rolling the vein before quite literally acting it out!

In addition to highlighting our attempts to capture some of the immediacy between learning and action, the two brief vignettes also highlight features of how we have chosen to represent the data. The vignette format conveys a sense that the activities of the clinic revolve around the specific needs of particular patients, and the level of detail we use is helpful in depicting how the co-op students are learning in the workplace. This form of data collection and representation was used for the duration of our study phase at the veterinarian clinic.

Goals of a Workplace Setting

Not until we observed in the clinic did we understand the impact of differences in institutional goals on student learning. Classrooms are devoted to student learning, but veterinary clinics are devoted to patient health and recovery, and to attracting customers willing to pay for the service. We might not expect learning opportunities to be interrupted in classrooms, but we came to expect this in the clinic especially if a patient was at risk. Also, the majority of standard procedures (spays, neuters, etc.) were conducted in silence, with the focus on the patient. Explicit instruction might be provided by one of the assistants before or after the procedure and when the patient's condition was stable.

What became apparent to us was that the well-being of the animal superseded all other activities. It impacted on what the co-op students' learning looked like, and it affected the ways in which we could collect relevant data that captured the co-op students' actions and reflections. The pilot phase of our study taught us how to identify the critical events of the clinic, and to be able to "read the situation" in order to judge the appropriateness of intervening for our research purposes.

The viability of the veterinary clinic is dependent on maintaining and growing the client base, and this goal cannot be compromised by the addition of co-op students. In fact, the needs of the clinic dictate that they become contributing members to the clinic activities quite quickly. Our pilot phase clearly showed us that, unlike a school setting, where learning in a course occurs each day during the term in manageable "conceptual chunks," workplace learning at the clinic was characterized by an intensive period of extensive learning during the early part of the term. Repetition and reinforcement followed this intensive period that lasted for the duration of the term. Although there are many opportunities for new learning that occur during the latter part of the term, most of these opportunities are the result of case-specific issues surrounding the diagnosis and treatment of a particular animal. The majority of the co-op students' responsibilities were established during the early part of their placement at the veterinary clinic.

The research team recognized this as the study of the first pair of co-op students occurred, and subsequently adjusted the timing of our site visits with the second pair of co-op students. Specifically, the team spent three mornings each week for seven weeks of the students' placement, then reduced this to one morning per week. This alteration in data collection was made in the hopes of capturing the richness of the breadth and depth of the co-op students' learning during the period of time when the learning curve was most steep.

Conceptions of Knowledge and Curriculum

For many Ontario students, the course credit that they receive for co-op education placements is directly related to a subject area. For example, once a student receives credit for an in-school biology course, he/she is eligible to participate in, and receive, up to two co-op biology credits. The fundamental premise underlying this arrangement is the stance that co-op education is a "mode of delivery" of subject matter that would typically be learned in classrooms. This stance sensitized us to look at learning in the workplace from a curriculum perspective.

We chose to use Schwab's commonplaces of curriculum (Schwab, 1972) as a framework to initially guide our data analysis. As such, the data collected from the veterinary clinic were approached initially by considering the teacher, the student, the subject matter, and the context. Generally, we would have little difficulty identifying the commonplaces within typical classrooms. Yet as our work in the veterinary clinic proceeded, we found the commonplaces to be problematic. Unlike the classroom where the teacher plays an explicit role in assisting the students in learning certain subject matter, and then assessing how well the students have learned, the workplace is much more complex for two reasons. First, the activities of the workplace focus on the primary objectives of the vet clinic, and not on the co-op students' placement experiences. This creates difficulties in trying to determine what is being taught, how it is being taught, and how it is being assessed because such aspects are often latent. Second, "learning in workplace" suggests that there is also "teaching in workplace." As discussed in the final section of the paper on "varieties of learning" we found that the co-op students learned in many different ways, and from many <u>different kinds</u> of teachers.

Since much of the curriculum of the workplace is latent, our approach to determining the aspects of what the co-op students were learning was guided by a broad pattern that became evident in our visits to the veterinary clinic. Specifically, and not surprisingly, we recognized that the co-op students would be introduced to what was important for them to do, and would then be given opportunities to earn the right to increased responsibilities associated with such tasks. By focusing our attention on the "natural curriculum" in the vet clinic, we were able to collect data that focused on the incremental increases in responsibility that the co-op students were given. Such instances often served as a focus for our on-site questioning, and for our interviews with clinic staff and co-op students.

The experience of watching and then learning the details of a procedure is a controlled and sequenced form of the informal learning that occurs within the "natural curriculum." An example of this phenomenon involved the anesthetic machine. This machine provided considerable and varied opportunities for learning. Learning was enhanced by the cues offered by the machine's operational sequence. The cues themselves acted as a guide for staff to determine the students' readiness to assume additional responsibilities associated with the machine. Interviews with the veterinary technician suggested that clinic staff visualize a step-by-step sequence for learning about the anesthetic machine that corresponds to the details of this "natural" curriculum. Kelly offered the following example:

> First you show the [co-op student] just the basics of how to watch an animal breathing. And if they seem to be able to figure that out really easily, then you explain the ins and outs of the machine, and what exactly is going on, and *why* you're watching this. Some people don't really seem to have the *want* to know the underlying reasons for things, and other people do. So...every individual's a bit different. [This co-op student] seemed to

> pick up things really quickly so you can go more in-depth. As I said, every person's different. Some people want only the glamorous aspect of the job, and so they skim the surface; they look at the animal, they watch the surgery, they stand back on the sidelines. Or you see people who really want to get into it and learn about it. Those people you obviously take more time with.

Kelly monitored the co-op students closely and followed their lead. She explained,

> ...if I really notice them, that what they're doing they've got it down pat and they're really looking to do other things, then I will assist them and show them other things to watch too, as far as surgeries go or anything else. When someone looks like they've got a job, and they know how to do it, and it's down pat now, and it's taking them half as long as it used to, you know that they're ready to do something else. If I see that, then we go on. If I don't see that, we stay at that level for a little while. I usually take it from what I see of them (March 26, 1997).

These interview excerpts clearly illustrate aspects of the "natural curriculum" within the veterinary clinic. More important, this unwritten curriculum can be articulated and modified for different students depending on their competence and willingness to learn.

Varieties of Learning

We were unprepared for the varieties of opportunities for learning offered by the workplace. As expected, much visual learning was available. But we did not anticipate the sequential learning organized by the veterinary assistants for the co-op students to develop familiarity with operating the anesthetic machine or for preparing for induction anesthesia, for example.

As data analysis began, we initially focused on what the co-op students had learned, the evidence that such learning had occurred, and how they came to learn it. We quickly realized that how the co-op students came to learn in the veterinary clinic was quite complex, but could be characterized within three domains. First, explicit instruction or intervention by clinic staff was an obvious way in which the co-op students learned, but we realized that the activities of clinic staff took many different forms. As reported in Chin, Young, and Munby (1998), clinic staff communicated workplace knowledge through directed questioning, direction instruction, direction with reason, demonstration, and think-alouds. As well, clinic staff seemed to follow an over-arching "natural curriculum" that was also dependent on the co-op students' abilities and willingness to learn.

Second, and somewhat problematic for us, we recognized that the co-op students did not only learn if they were being directly spoken to by a clinic staff member. This observational learning (Bandura, 1986) or peripheral participation (Lave & Wenger, 1991) introduced us to the potential that the co-op students can learn from watching events that involve other co-op students and/or clinic staff. We had difficulties with this domain of learning in the workplace because we lacked data that would constitute evidence of learning from a cognitive perspective. Nonetheless, there are interesting questions about observational learning and peripheral participation. For example, is learning occurring when one of the co-op students is watching while the other is participating, being shown a procedure, or receiving corrective instructions? And if so, are both co-op students learning the same thing even though one was the observer and the other was the participant?

Third, and of particular interest, was how experience seemed to function in the workplace: it did not appear to be simply subject matter or the "content to be learned," although in many cases it is. But experience appeared to have an expanded role in the veterinary clinic: it seemed to function much as a teacher might. As reported in Munby, Cunningham, and Chin (1998) *experience itself* can act as the

"teacher" in the co-op students' learning through skill learning (e.g., restraining an animal), through cues embedded within the routine itself, and through incongruities in routines that catalyze reflection.

Summary

The significance of the methodological challenges reported in this paper is directly connected to the significance of research in co-op education and workplace learning. Co-op education credits are taken by a large number of secondary-school students, but this portion of the school curriculum has received little attention in the research literature. There has been an increase in research on workplace learning itself, but this research has been driven by a focus on the organization, and most of the research is with adult learners. Very few studies on informal and workplace learning pay heed to the relationships between learning, knowledge, and experience, and fewer (if any) consider co-operative education placements. Despite the encouragement secondary-school students receive to participate in co-operative education programs, there seems to be little understanding of what secondary-school students are learning in these workplace settings, or how they are learning in such settings.

Our research on co-op education and workplace learning has forced us to engage in debates about the fruitfulness of various theoretical frameworks. We believe that an appropriate theoretical framework must consider the workplace experiences as curriculum, the special character of experiential learning, and a cognitive perspective on learning from experience. The methodological challenges presented in this paper highlight the interplay among the theoretical framework, data collection methods, and data analysis procedures. It is through such dialogues that we can gain a clear understanding of student learning in the workplace.

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